



First record of the trapdoor spider genus *Conothele* (Araneae, Ctenizidae) from India, with a description of two new species

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Abstract. The genus *Conothele* of the trapdoor family Ctenizidae is reported for the first time from India with the description of two new species *Conothele varvarti* from Similipal Tiger Reserve in Orissa, eastern India and *C. vali* from Tawang district in Arunachal Pradesh, northeastern India. The genus was previously considered arboreal in habit but the present record reveals that these two species are strictly ground dwelling. Notes on the natural history are provided for both species.

Keywords: Arunachal Pradesh, new species, Orissa, ground dwelling, arboreal

The family Ctenizidae (Orthognatha, Mygalomorphae) is one of the four families of trapdoor spiders found in India (Siliwal & Molur 2007). This family is represented by nine genera and 121 species from around the world (Platnick 2008). Only one genus *Latouchia* Pocock 1901 and one species *L. cryptica* (Simon 1897) is formally reported from India. Although, Gravely (1915, 1935) in his publications on Indian mygalomorph spiders included the genus *Conothele* Thorell 1878 based on a few unidentified specimens in the Indian Museum (now Zoological Survey of India), the genus was never formally described nor any species listed from India.

The genus *Conothele* was erected by Thorell in 1878 to accommodate *Conothele malayana* (Doleschall 1859), which was originally misplaced in the genus *Cteniza* Latreille 1829. Since then many new species of *Conothele* have been described (Thorell 1881, 1887, 1890; Pocock 1898, 1899; Kulczynski 1908; Strand 1913; Hogg 1914; Chamberlin 1917; Berland 1938; Saaristo 2002; Platnick 2008). In his revision of the infraorder Mygalomorphae, Raven (1985) synonymized the genus *Lechrictenus* Chamberlin 1917 with *Conothele*. Some species of *Ummidia* Thorell 1875 were transferred to *Conothele* (Raven 1985; Haupt 2006). The genus *Conothele* is known from 16 species and has a wide distribution range extending from Myanmar to Australia (Platnick 2008).

In this paper, two new species of *Conothele* are described based on female specimens collected from Orissa and Arunachal Pradesh. Males of the species could not be found even after repeated searching in the area where females were collected. Considering the significance of this find, we formally report the occurrence of the genus *Conothele* from India. It also confirms the earlier reports by Gravely (1915, 1935) of the existence of this genus in India. Information on the habitat, behavior, and burrow of the two new species are provided. Interestingly, in the present study, these spiders were found strictly ground dwelling though previously the genus was considered arboreal in habit (Pocock 1900; Gravely 1935). We

provide information on the burrow structure of these spiders, which is unique in comparison with other members of this genus.

The two new species from India are considered different from the rest of the known species of *Conothele* described from various islands of Australasia because of the geographical distribution. Geographically, the species closest in distribution to this new species is *Conothele birmanica* Thorell 1887 from Myanmar. RR examined the type specimen of *C. birmanica* at The Natural History Museum, London but spermathecae was not dissected, hence the information is lacking in this paper. Comparison with *C. birmanica* and *C. taiwanensis* Tso et al. 2003 is based only on available literature (Pocock 1900; Tso et al. 2003).

METHODS

Spiders were collected during the theraphosid spider surveys conducted in the year 2005 and 2007 in Arunachal Pradesh and Orissa respectively. The specimens are deposited at Wildlife Information Liaison Development Society, Coimbatore, Tamil Nadu. Measurements of body parts except for the eyes were taken with a Mitutoyo™ Vernier Caliper. Eye measurements were done with a calibrated ocular micrometer. All measurements are in mm. Spermathecae were dissected and cleaned in concentrated lactic acid in 100°C water bath for 15–20 minutes. All illustrations were prepared with the help of camera lucida attached to a CETII™ stereomicroscope by MS.

Abbreviations: ALE = anterior lateral eye, AME = anterior median eye, MOQ = median ocular quadrate, PLE = posterior lateral eye, PME = posterior median eye, PLS = posterior later spinnerets, PMS = posterior median spinnerets, WILD = Wildlife Information Liaison Development Society. Abbreviations used for hair and spines count are d = dorsal, fe = femur, mt = metatarsus, p = prolateral, pa = patella, r = retrolateral, ta = tarsus, ti = tibia, v = ventral.

TAXONOMY

Conothele Thorell 1878

Conothele Thorell 1878:303; Simon 1892:88; Pocock 1900:165

Type.—*Conothele malayana* (Doleschall 1859) designated based on a female specimen. Not examined.

Diagnosis.—It differs from other known genera of this family by trochanters I and II ventrally not notched (Raven 1985); tibia III consists of saddle-shape depression on the basal upper part (Figs. 8, 23) as seen in *Ummidia* (Pocock 1900; Raven 1985).

Conothele varvarti new species
(Figs. 1–15)

Type specimens.—INDIA: *Orissa*: holotype female, Barehipani road, Chahala range, Similipal Tiger Reserve, 744 m elev., 21°57'46.2" N, 86°20'23.4"E, 31 March 2007, Manoj V. Nair (WILD-07-ARA-163); *Orissa*, 1 paratype female, Ramthirtha, Jashipur, 419 m elev., 21°57'08.4"N, 86°04'14.0"E, 29 August 2007, M. Siliwal (WILD-07-ARA-207).

Other material examined.—INDIA: *Orissa*: 1 subadult ♀, Barehipani road, Chahala range, Similipal Tiger Reserve, 744 m elev., 21°57'46.2"N, 86°20'23.4"E, 31 March 2007, M. Nair (WILD-07-ARA-164); 2 immatures, Baniabasa, Udala range, Similipal Tiger Reserve, 545 m elev., 21°44'03.2"N, 86°26'51.8"E, 27 April 2007, Manoj V. Nair (WILD-07-ARA-165, 166); 2 immatures, before check gate of Jacum range, periphery of Karlapat Wildlife Sanctuary, 336 m elev., 19°44'49.3"N, 83°06'27.4"E, 14 April 2007, M. Siliwal, S. Behera (WILD-07-ARA-167, 168).

Diagnosis.—It differs from other known species of this genus by the posterior row of eyes weakly procurved (Fig. 3), (PRE straight in *C. birmanica*; PRE recurved *C. taiwanensis*); abdomen dorsally warty/rough (Fig. 1); spermathecae with bowl-shaped apical lobe on a stalk, which is twisted twice distally (Fig. 12) and carapace slightly shorter than patella and tibia of leg I and IV. It differs from *C. birmanica* by curved spines on tibiae I–II (Fig. 7).

Etymology.—The name of the species is based on the Sanskrit root of the word wart, referring to the warty appearance of the spider's abdomen.

Description of female holotype.—Total length, 15.52; carapace 5.52 long, 5.1 wide; chelicerae 2.42 intact. Abdomen 10.0 long, 6.84 wide. Spinnerets: PMS, 0.9 long, 0.3 wide, 0.1 apart; PLS, 2.0 total length (1.2 basal, 0.5 middle, 0.3 distal; mid-widths 1.1, 0.8, 0.65 respectively). Morphometry of legs and palp is given in Table 1.

Carapace: reddish-brown, glabrous except for five long hairs on caput, few lines of depression along interstitial ridges (Figs. 1, 2), weak crenulations on caput, more conspicuous near eye group and anteriolaterally, elsewhere absent or inconspicuous. Caput with distinct mound between fovea and eyes (Fig. 2). Fovea deep, procurved, U-shaped (Fig. 1).

Eyes (Fig. 3): eight in two rows, both rows procurved, posterior row slightly procurved, ocular group 0.8 long, 1.2 wide, about 0.3 of headwidth; diameter AME 0.3, PME 0.15, ALE 0.4, PLE 0.25; distance between ALE–AME 0.1, AME–AME 0.05, PLE–PME adjacent, PME–PME 0.4, ALE–ALE 0.6, ALE–PLE 0.2; MOQ not square, 0.6 long, 0.6 front width, 0.7 back width; clypeus 0.6 high.

Maxillae (Fig. 4): 1.7 long in front, 2.5 long in back, 1.4 wide; cuspule numbers not same on right and left maxillae, right maxillae with 14 small cuspules on prolateral-proximal corner, 16 large ones ventrally in $\frac{3}{4}$ of length, left maxillae with 8 small cuspules on prolateral-proximal corner, 17 large ventrally in $\frac{3}{4}$ of length. Anterior lobe absent or greatly reduced.

Labium (Fig. 4): 1.0 long, 1.4 wide, labiosternal groove shallow and slightly concave, 5 large cuspules in three rows (2 + 2 + 1) centrally, size of cuspules similar to that on maxillae.

Chelicerae (Fig. 5): 4 large promarginal teeth, 5 large and 1 very small retromarginal teeth, basomesal teeth absent; rastellum conspicuous, raised on a low mound, consisting of 12 thick spines on vertical face and up, of which 10 are in anterior row; many long and short spines present along anterior dorsal surface.

Sternum (Fig. 4): broader posteriorly, reddish-brown, with elevated anterior and lateral sides, sloping posteriorly, 3.68 long, 3.2 wide, covered with long black hair, more dense towards lateral sides, posterior angle blunt and not separating coxae IV. Sigilla large, irregular shape, centrally placed. Non-sigillate area with fine corrugations.

Legs: all legs similar in thickness, reddish-brown above and light yellowish-brown below except tarsi of palp and metatarsi and tarsi of all legs that are black above and reddish-brown below. Tibiae, metatarsi and tarsi of leg I–II and tibiae and tarsi of palp dorsoventrally flattened. Femora III clearly wider than rest. Tibiae III with saddle-shaped depression on basal upper part. Metatarsi of leg I, II, IV longer than tarsi. Metatarsal preening combs absent on all legs. Coxae of legs reddish-brown ventrally. Legs covered with sparsely distributed hair, bristles, and few curved thick thorn-like spines (Figs. 6–8). Two conspicuous hairless bands running over length of femora, patellae, and tibiae. Scopulae and claw tufts absent on tarsi of all legs and palp (Figs. 6–8). Leg formula 4132.

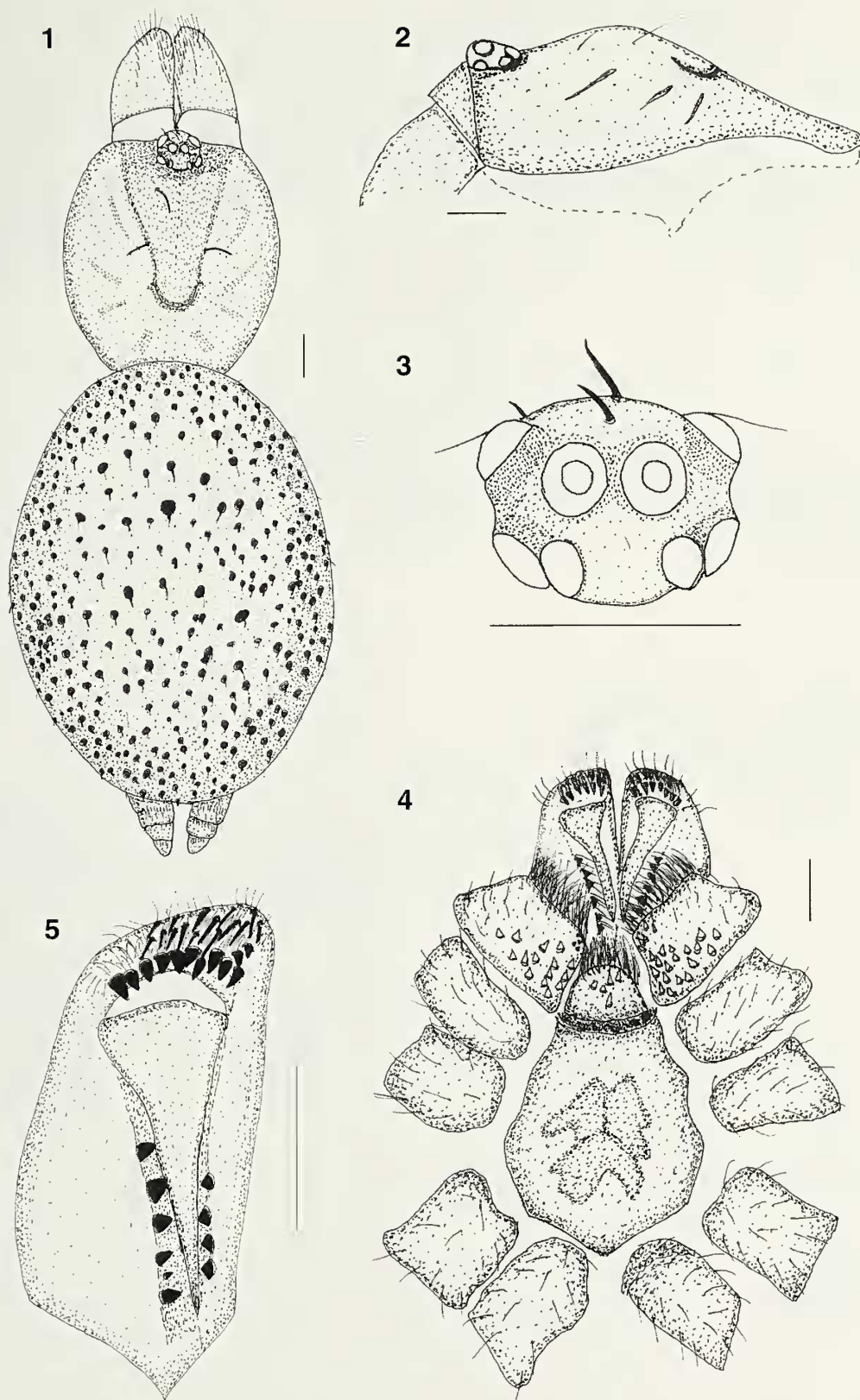
Spines (Figs. 6–8): curved thick thorn-like spines, ti I, p = 38, r = 41; mt I, p = 34, r = 24; ta I, p = 26, r = 15; ti II, p = 26, r = 21; mt II, p = 30, r = 8; ta II, p = 23, r = 7; pa III, p = 10; ti III, p = 3; mt III, d = 4; ta III, p = 9, r = 3; mt IV, p = 3; ta IV, p = 6; palp, pa, p = 1; ti, p = 46 + 2 broken, r = 41; ta, p = 45 + 2 broken, r = 43.

Trichobothria: mt I–II with 10 filiform trichobothria in two rows in distal half; ta I with 4 clavate trichobothria centrally, 12 filiform in two longitudinal rows; ta II with 7 clavate in basal one fourth, 10 filiform in two longitudinal rows; ta III with 4 clavate in basal one fourth, 16 filiform in two longitudinal rows; ta IV with 2 clavate basal, 5 filiform in two rows in distal half; palp, ti with 10–12 filiform in two curved rows; ta with 5 clavate in center, 12 filiform in 2 longitudinal rows.

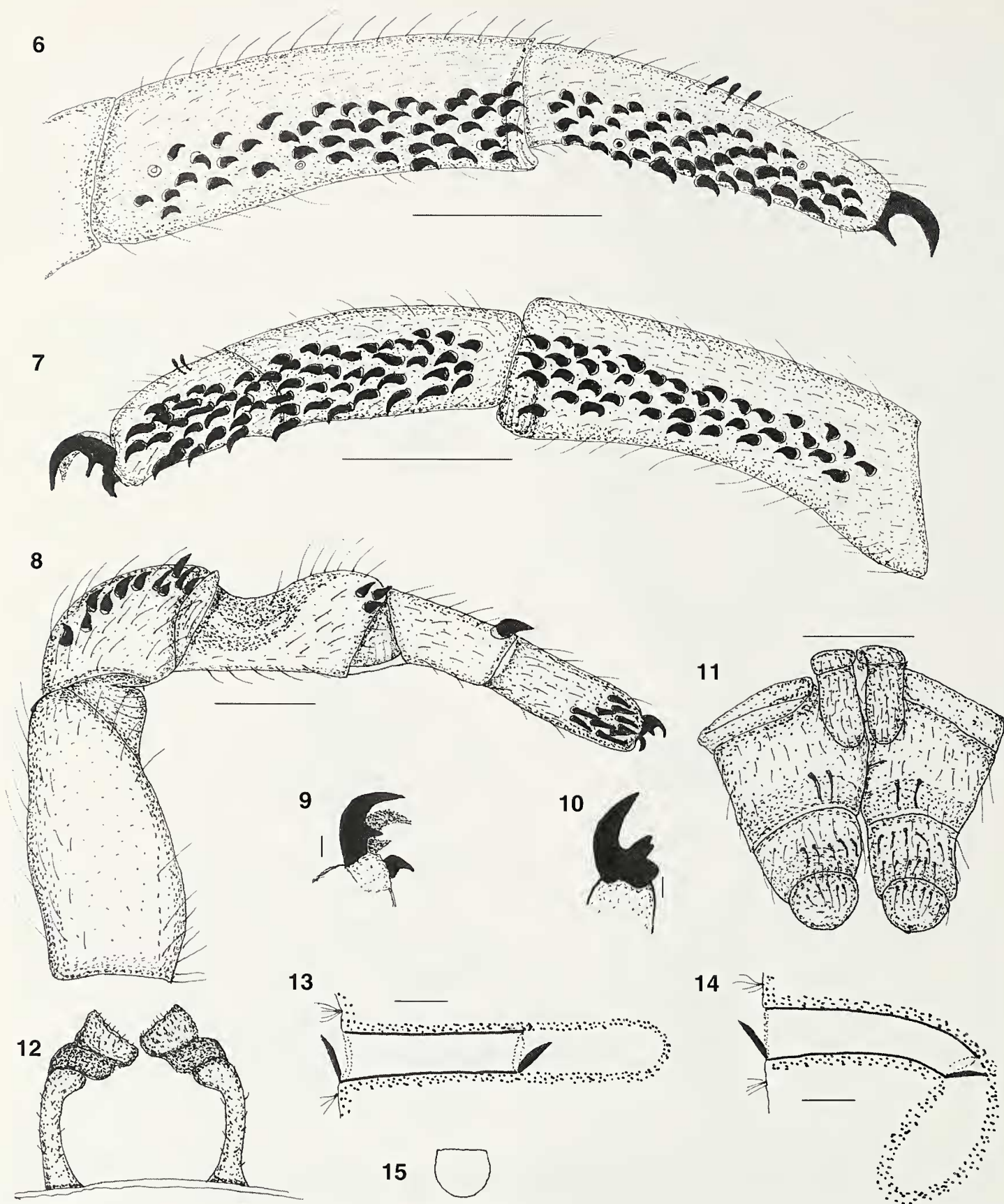
Leg coxae: coxa IV slightly wider than III, I and II subequal.

Claws: all legs with three claws, paired claw with single tooth (Fig. 9). Palp with single claw bearing a single unequal bifid tooth (Fig. 10).

Abdomen: grayish-brown, with few yellow small spots, covered with short and long thorn-like setae and several bristles, which gives it a warty appearance (Fig. 1); one in 6–8 thorns is long and is about 2–3 times longer and slightly



Figures 1–5.—*Conothele varvarti* new species, female: 1. Cephalothorax and abdomen, dorsal view; 2. Cephalothorax, lateral view; 3. Eyes; 4. Sternum, labium, maxillae and chelicerae; 5. Chelicerae, rastellum, promarginal and retromarginal teeth. Scale = 1.0 mm.



Figures 6–15.—*Conothele varvarti* new species, female: 6. Tibia and tarsus of palp, prolateral view; 7. Tibia, metatarsus and tarsus of leg I, prolateral view; 8. Leg III (femur to tarsus) prolateral view; 9. Claw of leg I; 10. Claw of palp; 11. Spinnerets; 12. Spermathecae; 13, 14. Burrow structure; 15. Hinged door. Scale = 1.0 mm (Figs. 6–8, 11, 12); 0.1 mm (Figs. 9, 10); 10.0 mm (Figs. 13–15).

Table 1.—Morphometry of legs and palp of the holotype female (WILD-07-ARA-163) and paratype female (WILD-07-ARA-207) of *Conothele varvarti* new species.

	Leg I		Leg II		Leg III		Leg IV		Palp	
	Holo #163	Para #207	Holo #163	Para #207	Holo #163	Para #207	Holo #163	Para #207	Holo #163	Para #207
Femur	4.2	2.84	3.30	2.44	3.12	2.24	4.0	3.12	4.24	3.34
Patella	2.46	2.10	2.14	1.66	2.0	1.56	2.36	2.14	2.16	1.44
Tibia	3.12	2.18	1.9	1.42	1.74	1.78	2.92	2.3	3.0	1.7
Metatarsus	1.42	1.12	1.46	1.10	1.26	1.0	2.42	1.86	-	-
Tarsus	1.32	0.9	1.12	0.9	1.96	1.44	1.72	0.88	2.3	1.8
Total	12.52	9.14	9.92	7.52	10.08	8.02	13.42	10.3	11.7	8.28
Midwidth										
Femur	1.0	0.64	0.9	0.52	1.42	0.94	1.2	0.64	1.1	0.62
Tibia	1.06	0.72	0.96	0.68	1.0	0.72	1.0	0.72	1.0	0.72

thicker than short thorns. Ventrally yellowish, faint black patch above book lungs, uniformly covered with short and long bristles.

Spinnerets: PMS digitiform covered with brown hair; PLS, covered with brown hair, apical segment dome-shape (Fig. 11).

Spermathecae: bowl-shape apical lobe on a stalk, which is twisted twice distally (Fig. 12).

Description of female paratype (WILD-07-ARA-204).—Total length 11.24; carapace 4.52 long 3.44 wide; chelicerae 1.36 long intact, 8 retromarginal and 4 promarginal teeth. Sternum 2.24 long, 2.0 wide. Labium 0.64 long, 0.96.2 wide, 9 large cuspules in 3 rows (5 + 2 + 2). Maxillae 2.06 long back, 1.28 long front, 1.08 wide, cuspules 20–24 of varying size in angular shape. Abdomen 6.72 long and 5.18 wide. Spinnerets: PMS, 0.6 long, 0.2 wide, 0.14 apart; PLS, 1.44 total length (0.72 basal, 0.42 middle, 0.3 distal; midwidths 0.8, 0.56, 0.34 respectively). Morphometry of leg and palp given in Table 1. Rest of the characters are same as holotype (WILD-07-ARA-163).

Distribution.—India, Orissa: Chahala, Upper Barahkamura, Jenabil and Baniabasa ranges in Similipal Tiger Reserve, Maurbhanj district; Ramthirtha in Jashipur; Karlapat Wildlife Sanctuary in Kalahandi district.

NATURAL HISTORY

Individuals of *C. varvarti* new species were found throughout Similipal Tiger Reserve, where more than 30 burrows of various sizes were located and almost all were found on mossy roadside cuttings close to the ground and up to 1.5 m, both in open and closed canopy areas. Similarly, several burrows of the species were located on roadside bunds in the periphery of Karlapat WLS in southern Orissa suggesting the species to be ground dwelling. This differs from what was previously reported by Pocock (1900) that the spiders of this genus from Myanmar and islands of Australasia were arboreal in habit with their trapdoor retreats on tree trunks. Also, Gravely (1935) reported a male of this genus in a retreat built in deodar *Cedrus deodara* humus, which he mentions as unusual since these spider retreats were generally found on tree trunks.

The burrow of *C. varvarti* new species consists of a short silken tube about 60–70 mm long and 15–22 mm wide, and mostly aligned perpendicular to the angle of the slope of

roadside bund (Figs. 13,14). The entrance of the burrow is closed with a moderately thick D-shaped hinged trapdoor (about 15 mm wide), with the attached side being straight rather than curved (Fig. 15). Also, the door hinge is mostly at the base or on the sides of the entrance but never at the top. The trapdoor is well camouflaged with soil and bits of dried leaves and moss. On the inner end of the burrow a second D-shaped hinged trapdoor exists, which opens into another chamber or retreat devoid of any silk lining (Figs. 13, 14). This unique burrow structure is probably a strategy to escape from intruders.

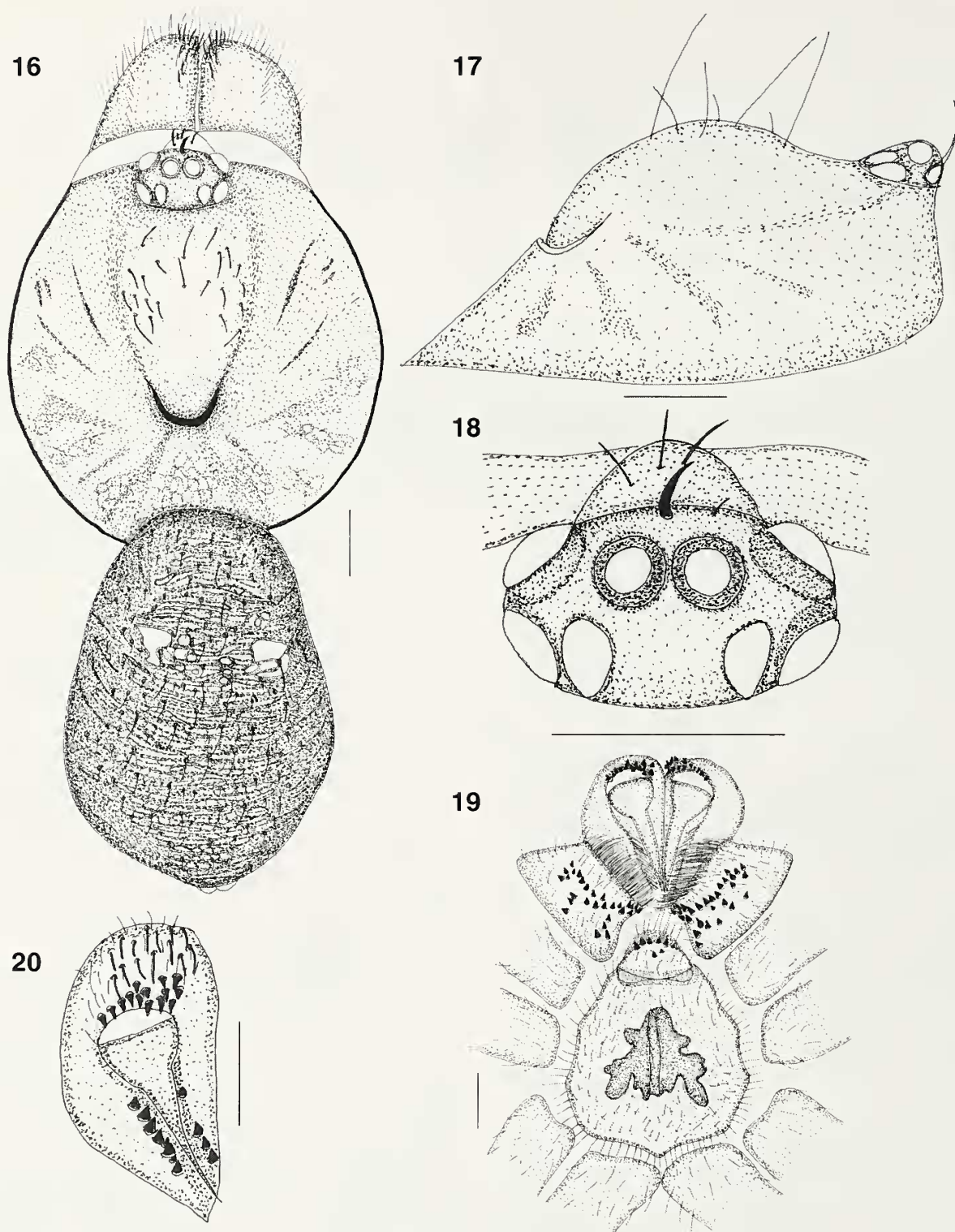
Conothele vali new species (Figs. 16–27)

Type specimen.—INDIA: *Arunachal Pradesh*: holotype female, near Shurbi village, Tawang District, 1856 m elev., 27°33'27.2"N, 91°53'41.5"E, 13 May 2005, M. Siliwal (WILD-05-ARA-77).

Diagnosis.—It differs from other known species of this genus in having posterior row of eyes weakly procurved (Fig. 18) as seen in *C. varvarti* new species (PRE straight in *C. birmanica*; PRE recurved *C. taiwanensis*); eight cuspules on labium (Fig. 19) (5 cuspules of *C. birmanica* and *C. varvarti* new species; 14 cuspules in *C. taiwanensis*); 3 small and 26–28 large cuspules on maxillae (Fig. 19) (8 small and 16–17 large cuspules in *C. varvarti*; 53 cuspules in *C. taiwanensis*); abdomen heavily wrinkled (Fig. 16) (warty in *C. varvarti*, normal in *C. birmanica* and *C. taiwanensis*); spermathecae with globular apical lobe on a stalk, which is bent twice distally in zigzag manner (Fig. 27) (in *C. varvarti*, stalk is twisted twice and anterior lobe is bowl-shape; stalk right-angled curve at apical globe in *C. taiwanensis*); it differs from *C. birmanica* by curved spines on tibiae I–II (Figs. 21, 22); it differs from *C. varvarti* in leg formula 4123 (4132 in *C. varvarti*, Table 2); paired claws on all the legs with two unequal teeth (Fig. 24) (single tooth on paired claw of legs I–III in *C. varvarti* and *C. birmanica*; row of teeth in *C. taiwanensis*).

Etymology.—The species is derived from the Sanskrit word *vali* meaning wrinkle, as one of the characteristic features of this spiders is its heavily wrinkled abdomen.

Description of female holotype.—Total length, 11.30; carapace 5.92 long, 5.54 wide; chelicerae 1.76 intact. Abdomen 5.38 long, 4.4 wide. Spinnerets: PMS, 0.8 long, 0.3 wide, 0.5 apart; PLS, 1.5 total length (0.7 basal, 0.3 middle, 0.5 distal;



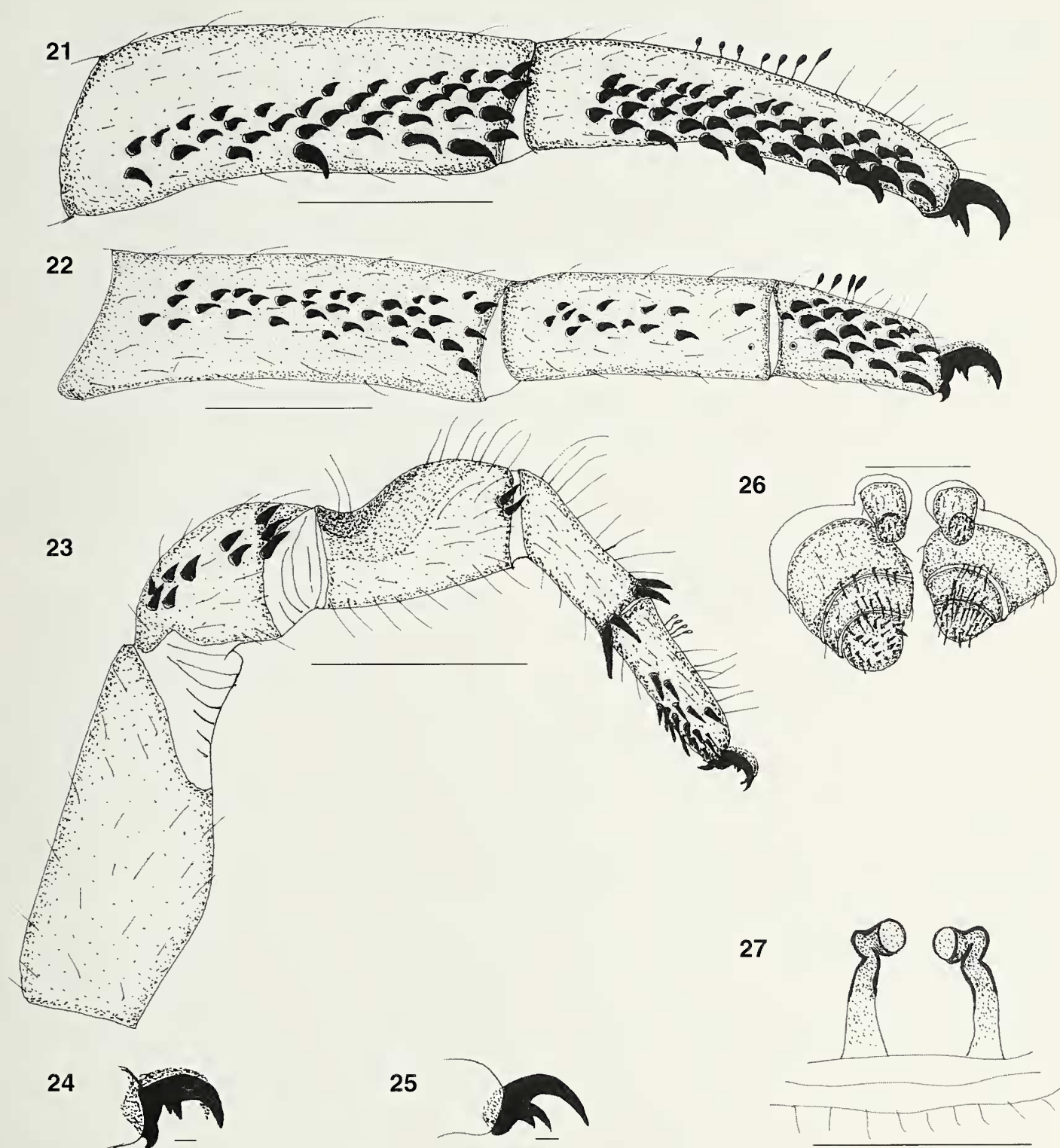
Figures 16–20.—*Conothele vali* new species, female: 16. Cephalothorax and abdomen, dorsal view; 17. Cephalothorax, lateral view; 18. eyes; 19. Sternum, labium, maxillae and chelicerae; 20. Chelicerae, rastellum, promarginal and retromarginal teeth. Scale = 1.0 mm.

midwidths 1.1, 0.9, 0.7 respectively). Morphometry of legs and palp is given in Table 2.

Carapace: reddish-brown, glabrous; black with net-like design, more prominent on the posterior half; thin black band present at periphery; few lines of depression along the interstitial ridges (Fig. 16), weak crenulations on caput, more conspicuous anteriolaterally and near eye region, elsewhere

absent or inconspicuous. Caput with distinct mound between fovea and eyes, about twice higher than eyes (Figs. 16, 17). Fovea deep, procurved, U-shaped (Fig. 16). Bristles: 3 long and 18 short ones on caput; one long at anterior edge of ocular tubercle; 2 long and 2 short ones on clypeal plate.

Eyes (Fig. 18): eight in 2 rows, both rows slightly procurved; ocular group 1.0 long, 1.4 wide, about 0.4 of headwidth.



Figures 21–27.—*Conothele vali* new species, female: 21. Tibia and tarsus of palp, retrolateral view; 22. Leg I (tibia to tarsus), prolateral view; 23. Leg III (femur to tarsus), prolateral view; 24. Claw of leg I; 25. Claw of palp; 26. Spinnerets; 27. Spermathecae. Scale = 1.0 mm (Figs. 21–23, 26, 27); 0.1 mm (Figs. 24, 25).

Diameter AME 0.4, PME 0.2, ALE 0.6, PLE 0.3; distance between ALE–AME 0.15, AME–AME 0.1, PLE–PME adjacent, PME–PME 0.5, ALE–ALE 0.7, ALE–PLE 0.2; MOQ not square, 0.8 long, 0.8 front width, 1.0 back width; clypeus 0.7 high.

Maxillae (Fig. 19): 1.8 anterior length, 2.5 posterior length, 1.4 wide; cuspule numbers not same on right and left maxillae,

right maxillae with 3 small ones on prolateral-proximal corner, 26 large ones ventrally in $\frac{3}{4}$ of length, left maxillae with 3 small ones on prolateral-proximal corner, 28 large ones ventrally in $\frac{3}{4}$ of length. Anterior lobe absent or greatly reduced.

Labium (Fig. 19): 0.9 long, 1.3 wide, shallow labiosternal groove slightly concave; a pair of rectangular black patches

Table 2.—Morphometry of legs and palp of holotype female (WILD-05-ARA-77) of *Conotele vali* new species.

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	4.12	3.58	3.22	4.1	3.48
Patella	2.30	2.30	2.14	2.24	2.32
Tibia	2.68	2.34	2.08	2.82	2.54
Metatarsus	2.06	1.56	1.74	2.56	-
Tarsus	1.24	1.34	1.88	1.52	2.28
Total	12.4	11.12	11.06	13.24	10.62
Midwidth					
Femur	0.88	0.9	1.48	0.9	0.9
Tibia	1.0	0.9	0.98	0.9	1.14

covers basal $\frac{1}{4}$ of labium and labiosternal groove; 8 large cuspules in 2 rows (6 in anterior row and 2 behind centrally), size of cuspules similar to that of maxillae.

Chelicerae (Fig. 20): 3 large and one small promarginal teeth, 6 large and 2 very small retromarginal teeth, basomesal teeth absent; rastellum conspicuous, raised on a low mound, consist of 14 thick spines on vertical face and up, with 8 in anterior row; many long and short spines present along entire anterior dorsal surface.

Sternum (Fig. 19): broader posteriorly, reddish-brown, elevated anterior and lateral sides, sloping posteriorly, 3.22 long, 3.34 wide, covered with long black hair, more towards lateral sides, posterior angle blunt and not separating coxae IV. Sigilla large, irregular shape, centrally placed. Non-sigillate area with fine corrugations.

Legs: all legs similar in thickness, reddish-brown above and light yellowish-brown below except tarsi of palp and metatarsi and tarsi of all legs that are dark brown above and reddish-brown below. Tibiae, metatarsi and tarsi of leg I–II and tibiae and tarsi of palp dorsoventrally flattened. Femora III clearly wider than rest. Tibia III with saddle-shape depression on basal upper part. Metatarsi of leg I, II, IV longer than tarsi. Metatarsal preening combs on all legs absent. Coxae of legs yellowish-brown ventrally. Legs covered with sparsely distributed hair, bristles and few curved thick thorn-like spines (Figs. 21–23). Two conspicuous hairless bands running longitudinally on femora, patellae, and tibiae. Scopulae and claw tufts absent on tarsi of all legs and palp. Leg formula 4123.

Spines (Figs. 21–23): curved thick thorn-like spines present on leg I–II and palp, rest normal thick spines, ti I, p = 33, r = 39; mt I, p = 13 + 1 broken, r = 29; ta I, p = 20 + 1 broken, r = 15; ti II, p = 21, r = 13; mt II, p = 23, r = 15, v = 1; ta II, p = 17, r = 9; pa III, p = 10; ti III, p = 2; mt III, p = 2, d = 4, r = 3; ta III, p = 13, r = 6; mt IV, p = 2; ta IV, p = 11, v = 2; palp, pa, p = 1; ti, p = 35, r = 37; ta, p = 44, r = 41.

Trichobothria: mt I–II with 6 filiform trichobothria in two rows in distal half; mt III with 6 short filiform distally; mt IV with 14 short filiform for length; ta I with 5 clavate trichobothria in basal half, 10 filiform in two longitudinal rows; ta II with 5 clavate in basal half, 12 filiform in two longitudinal rows; ta III with 5 clavate in basal $\frac{1}{4}$, 18 filiform in two longitudinal rows; ta IV with 4 clavate basal $\frac{1}{4}$, 10 filiform in two longitudinal rows; palp, ti with 8 filiform in curved two rows; ta with 9 clavate centrally, 12 filiform in 2 rows in distal half.

Leg coxae: coxa IV slightly wider than III, I and II subequal.

Claws: all legs with three claws, paired claw with two unequal teeth (Fig. 24). Palp with single claw bearing single unequal bifid tooth (Fig. 25).

Abdomen (Fig. 16): grayish-black with few yellow small spots, wrinkled integument, covered with short and long thorn setae and several bristles; one in 6–8 thorns is long and is about twice longer and slightly thicker than the short thorns. Ventrally yellowish-black, uniformly covered with short and long bristles.

Spinnerets (Fig. 26): PMS digitiform covered with brown hair; PLS, covered with brown hair, apical segment dome-shape.

Spermathecae (Fig. 27): globular apical lobe on a stalk, which is bent (almost 45°) twice distally in zigzag manner.

Distribution.—Known only from the type locality, Tawang, Arunachal Pradesh, India

NATURAL HISTORY

The spider was found in the open along a narrow trail and on the ground at about 2000 m above sea level. The habitat around was mostly secondary scrub with few pine trees, *Pinus wallichiana*, growing nearby. The burrow of this spider could not be located as the spider was found in the open; probably the burrow was washed away due to the heavy rainfall at that time.

COMMENTS

An important character which distinguishes *Conothele* from *Ummidia* is the presence of a single short tooth on paired claws of legs I–III (Raven 1985). The transfer of *Ummidia taiwanensis* Tso et al. 2003 and *Ummidia fragaria* (Dönitz 1887) to the genus *Conothele* reveals that these species possess more than one dentition pattern on the paired claws of legs I–III, which does not match the generic key. Similarly, *C. vali* new species also possesses two teeth on the paired claws rather than a single tooth as seen in *C. varvarti* new species. The only character which can distinguish *Conothele* from *Ummidia* will be the absence of the notch on trochanters I–II. Therefore, there is a need to revise the diagnosis of genera, and the generic key of the family Ctenizidae.

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LITERATURE CITED

- Berland, L. 1938. Araignées des Nouvelles Hébrides. *Annales de la Société Entomologique de France* 107:121–190.
- Chamberlin, R.V. 1917. New spiders of the family Aviculariidae. *Bulletin of the Museum of Comparative Zoology* 61:25–75.
- Gravely, F.H. 1915. Notes on Indian mygalomorph Spiders. *Records of Indian Museum, Calcutta* 11:257–287.
- Gravely, F.H. 1935. Notes on Indian mygalomorph spiders. II. *Records of Indian Museum, Calcutta* 37:69–84.
- Haupt, J. 2006. On the taxonomic position of the East Asian species of the genus *Ummidia* Thorell, 1875 (Araneae: Ctenizidae). *In* European Arachnology 2005. (C. Deltshv & P. Stoev, eds.). *Acta Zoologica Bulgarica, Supplementum* 1:77–79.
- Hogg, H.R. 1914. Spiders collected by the Wollaston and British Ornithological Union Expeditions in Dutch New Guinea. *Proceedings of the Zoological Society, London* 137:56–58.
- Kulczyn'ski, W. 1908. Araneae musei nationalis Hungarici in regionibus Indica et Australia a Ludovico Biro collectae. *Annals Historico-Naturales Musei Nationalis Hungarici* 6:428–494.
- Platnick, N.I. 2008. The World Spider Catalog, Version 8.5. American Museum of Natural History, New York. Online at <http://research.amnh.org/entomology/spiders/catalog/index.html> (Accessed on 3 March 2008).
- Pocock, R.I. 1898. Scorpions, Pedipalpi and spiders from the Solomon Islands. *Annals and Magazine of Natural History* (7) 1:457–475.
- Pocock, R.I. 1899. Scorpions, Pedipalpi and spiders collected by Dr Willey in New Britain, the Solomon Islands, Loyalty Islands, etc... *In* Zoological Results Based on Material from New Britain, New Guinea, Loyalty Islands and Elsewhere. (A. Willey, ed.). London 1:95–120.
- Pocock, R.I. 1900. The Fauna of British India, Including Ceylon and Burma. Arachnida. Taylor and Francis, London. 279 pp.
- Raven, R.J. 1985. The spider infraorder Mygalomorphae (Arancac): cladistics and systematics. *Bulletin of the American Museum of Natural History* 182:1–180.
- Saaristo, M.I. 2002. New species and interesting new records of spiders from Seychelles (Arachnida, Arancaca [sic]). *Phelsuma* 10(Supplement A):1–31.
- Siliwal, M. & S. Molur. 2007. Checklist of spiders (Arachnida: Araneae) of South Asia including the 2006 update of Indian spider checklist. *Zoos' Print Journal* 22:2551–2597.
- Strand, E. 1913. Neue indoaustralische und polynesische Spinnen des Senckenbergischen Museums. *Archiv für Naturgeschichte* 79(A6): 113–123.
- Thorell, T. 1881. Studi sui Ragni Malesi e Papuani. III. Ragni dell'Austro Malesia e del Capo York, conservati nel Musco civico di storia naturale di Genova. *Annali del Museo civico di storia naturale di Genova* 17:1–727.
- Thorell, T. 1887. Viaggio di L. Fea in Birmania e regioni vicine. II. Primo saggio sui ragni birmani. *Annali del Museo civico di storia naturale di Genova* 25:5–417.
- Thorell, T. 1890. Studi sui ragni Malesi e Papuani. IV, 1. *Annali del Museo civico di storia naturale di Genova* 28:1–419.
- Tso, I.-M., J. Haupt & M.-S. Zhu. 2003. The trapdoor spider family Ctenizidae (Arachnida: Araneae) from Taiwan. *The Raffles Bulletin of Zoology* 51:25–33.

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